DOCUMENT RESUME

ED 078 889 PS 005 755

AUTHOR McGurk, Harry
TITLE The Salience of Orientation in Young Children's Perception of Form.
INSTITUTION Educational Testing Service, Princeton, N.J.
SPONS AGENCY National Inst. of Child Health and Human Development (NIH), Bethesda, Md.; Social Science Research Council, London (England).
REPORT NO ETS-RB-72-13
PUB DATE Mar 72
NOTE 15p.

EDRS PRICE MF-$0.65 HC-$3.29
DESCRIPTORS *Nursery Schools; *Orientation Materials; *Perception Tests; Preschool Education; Statistical Analysis; Technical Reports; *Visual Perception

ABSTRACT

Forty-two nursery school children were exposed to two procedures designed to assess their discrimination of orientation. Under one procedure, subjects had no difficulty in discriminating between stimuli which differed only in orientation. Under a second procedure, where color and size of stimuli were also varied, orientation proved to be a discriminative cue of relatively low salience. These findings obtained for perception both of realistic and of abstract forms. (Author)

ED 078889

RESEARCH BULLETIN

PS 005755

U S DEPARTMENT OF HEALTH
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION
THIS DOCUMENT HAS BEEN REPRO
DUCED EXACTLY AS RECEIVED FROM
THE PERSON OR ORGANIZATION ORIGIN
ATING IT. POINTS OF VIEW OR OPINIONS
STATED DO NOT NECESSARILY REPRE
SENT OFFICIAL NATIONAL INSTITUTE OF
EDUCATION POSITION OR POLICY

RB-72-13

THE SALIENCE OF ORIENTATION IN YOUNG CHILDREN'S PERCEPTION OF FORM

Harry McGurk

This Bulletin is a draft for interoffice circulation. Corrections and suggestions for revision are solicited. The Bulletin should not be cited as a reference without the specific permission of the author. It is automatically superseded upon formal publication of the material.

Educational Testing Service
Princeton, New Jersey
March 1972

FILMED FROM BEST AVAILABLE COPY

ED 078889

THE SALIENCE OF ORIENTATION IN YOUNG CHILDREN'S PERCEPTION OF FORM

Harry McGurk

Educational Testing Service

Abstract

Forty-two nursery school children were exposed to two procedures designed to assess their discrimination of orientation. Under one procedure subjects had no difficulty in discriminating between stimuli which differed only in orientation. Under a second procedure, where color and size of stimuli were also varied, orientation proved to be a discriminative cue of relatively low salience. These findings obtained for perception both of realistic and of abstract forms.

PS 005755

THE SALIENCE OF ORIENTATION IN YOUNG CHILDREN'S PERCEPTION OF FORM[1]

Harry McGurk

Educational Testing Service

Most previous studies of the role of orientation in young children's perception of form have concerned themselves with the absolute question of whether orientation is discriminated. Contradictory conclusions have emerged on the basis of such studies. Until relatively recently it was generally accepted that the younger child recognized a form equally well in any orientation, that he did not discriminate between different orientations of the same form and, consequently, that orientation was not a factor in the young child's form perception. This is the standard textbook view (e.g.,Mussen, Conger,& Kagan, 1963, p. 250). Since the mid-1950's, however, numerous studies have been published which demonstrate that, from an early age, young children are capable of discriminating between stimuli differing only in orientation. Prominent among the latter are the various studies by Ghent and her colleagues (Ghent, 1960, 1961, 1964; Ghent & Bernstein, 1961; Ghent, Bernstein,& Goldweber, 1960). Ghent has gone as far as to argue that young children are markedly dependent upon the familiar, upright orientation for recognition of realistic figures (Ghent, 1960). This conclusion is in direct conflict with the earlier view.

Examination of the literature suggests that the number of stimulus dimensions manipulated has considerable influence upon young children's discrimination of orientation. Where orientation is the only dimension on which stimuli differ and subjects are required to make only a visual

discrimination, as in the studies by Ghent, discrimination of orientation is observable from an early age, possibly as early as six weeks (McGurk, 1970). On the other hand, where other dimensions are manipulated in addition to orientation, confusion of orientations is marked; in such circumstances young children appear to respond to stimuli as equivalent over a wide range of orientation differences, though such errors decrease with increasing age (e.g.,Davidson, 1934; Gibson, Gibson, Pick, & Osser, 1962). These findings suggest that when young children fail to respond discriminantly to stimuli differing in orientation, it is not because they are incapable of detecting orientation differences but because, for them, orientation is of low salience as a discriminative cue, eliciting less attention than other, more salient, stimulus dimensions. The present study was conducted to test this hypothesis. It was established firstly that the subjects involved could discriminate visually between different orientations of the same form. Secondly, the relative salience of orientation as a discriminative cue was assessed in conditions where other stimulus dimensions, namely size and color, were also subject to variation.

Method

Subjects

Forty-two children, 21 boys and 21 girls, from a nursery school in central Glasgow acted as subjects. All were from families of low socio-economic status. Ages ranged from 3 years 1 month to 5 years 3 months (median = 4 years 3 months).

Materials

Stimuli were drawn on square white cards, 8.5 cm. to a side. Cards were covered with clear celluloid to prevent soiling. Three sets of such stimuli each comprised a standard form and six variants. Two sets were realistic (line drawings of a house and a model boat) and one was abstract (an omega-like figure adapted from Ghent, 1961). Each standard figure was approximately 5 cm. high and was drawn in black india ink. Within each set the six variants of the standard were as follows: identical to the standard in every detail (I); differing from the standard in orientation by 90 degrees (I_{90}); differing from the standard in orientation by 180 degrees (I_{180}); half the size of the standard (1/2 I); different color from the standard--red instead of black (Ir); half the size of the standard, red instead of black and differing in orientation by 180 degrees (1/2 I_{180},r).

Procedure

Each S was presented with two types of tasks, one to assess orientation discrimination, the other to determine the relative salience of orientation as a discriminative cue. The former always preceded the latter.

Ghent's (1961) procedure was employed in the first task. The E and S sat side by side at a table and a pair of variants, I and I_{180}, or I and I_{90}, was placed before S. For each pair, S was asked to point to the one which was upside-down or wrong. All Ss were tested under two conditions, realistic and abstract. For boys, boat figures represented the realistic condition and for girls house figures were employed; "sex-appropriate" figures served to arouse and maintain Ss' interest in

the task but did not appear to exert any systematic effect upon responses. Both sexes were exposed to the same abstract figures. Realistic figures were always presented first. Within each condition the sequence of presentation of I versus I_{90} and I versus I_{180} contrasts was counterbalanced across Ss and the right-left position of the I variant was randomly varied.

A paired-comparisons, matching-to-sample procedure was employed to assess the relative salience of the three dimensions manipulated in the second part of the study. The standard form was placed on the table in front of S and two variants were placed side by side, below the standard. E pointed to each variant in turn and asked S to look at it carefully. The S was then asked to point to the variant which looked "most like" or "most the same" as the standard and his response was recorded. The first pair of variants was then replaced by a second pair and the instructions repeated. This procedure was continued until all 15 paired comparisons of the variants had been presented. All Ss were again tested under realistic and abstract conditions and the realistic figures were again presented first. Under each condition, the 15 paired comparisons were presented in the same predetermined random sequence; the right-left position of variants within each pair was counterbalanced across Ss. No feedback was given concerning response accuracy but thoughout the entire procedure Ss were encouraged in a general way.

Results

In the first part of the experiment all 42 Ss correctly identified the disoriented form of the realistic figures both in the I versus I_{90} and I versus I_{180} contrasts. With the abstract figure, 41 Ss

judged the omega to be upside-down when the gap was at the top (I_{180}), and in the I versus I_{90} contrast the 90 degree variant was judged to be wrong by all Ss. Thus, present Ss had no difficulty in discriminating between stimuli differing in orientation alone, a finding which corresponds to those reported by Ghent (1961) and Wohlwill and Weiner (1964) for children of comparable age.

In the paired comparison experiment, each variant of the standard was presented to S five times, each time along with another, different variant. For individual subjects a score was therefore assigned to each variant according to the number of times it had been judged more similar to the standard. David's (1963) D-test was applied to these data. The D-test is a nonparametric analogue of the F-test for equality of treatment means in analysis of variance and has been developed specifically for paired comparisons designs. It provides a test of the hypothesis that there are no differences between the summed scores of n judges for each of t items contrasted with each other by the method of paired comparisons. D is distributed approximately as χ^2 with t - 1 degrees of freedom.

To facilitate evaluation of age and sex, the sample was divided at the median age (4 years 3 months) and separate D-tests were carried out on the data for each age/sex group. Results of analysis of summed scores for each subgroup are presented in Tables 1 and 2 for variants of realistic and abstract figures respectively.

- - - - - - - - - - - - - - - - -

Insert Tables 1 and 2 about here

- - - - - - - - - - - - - - - - -

Tables 1 and 2 reveal a marked similarity between results for realistic and abstract conditions. For all subgroups the absolute values of summed scores for each variant are very similar under the two conditions. This, together with the fact that under both conditions subjects in each subgroup judged the I variant to be more similar to the standard with greatest frequency and judged the 1/2 I_{180}, r variant to be more similar to the standard with least frequency, indicates that the procedure employed here was both reliable and valid. It is also clear from Tables 1 and 2 that, although subjects in each age/sex group discriminated significantly between the variants, in terms of their similarity to the standard, the groups differ from each other in the extent to which they discriminated between the variants. To determine the nature and extent of these differences, a series of orthogonal comparisons was carried out for each subgroup separately on data for realistic and abstract figures. The method followed was similar to that employed in orthogonal comparisons of treatment means in analysis of variance, an analogous procedure having been developed for paired comparison designs (David, 1963).

Results of these comparisons were identical for realistic and abstract figures. For all groups, variants which differed in color and/or size (1/2 I, Ir, 1/2 I_{180}r) were judged less similar to the standard than variants which were the same as the standard in color and size (I, I_{90}, I_{180}); χ^2 = 33.92 - 64.69; 1 df; $p < 0.001$. None of the groups discriminated, in terms of similarity to the standard between the 1/2 I and Ir variants. Similarly, they did not discriminate between the I_{90} and I_{180} variants. Only older males discriminated significantly between the I variant on the one hand and the I_{90} and

I_{180} variants on the other; $\chi^2 = 9.31 - 13.00$, 1 *df*; $p < 0.01$. That is, apart from this group, all other *Ss* judged the I, I_{90} and I_{180} variants to be equally similar to the standard, $\chi^2 = 0.13 - 3.55$; 1 *df*; $0.90 > p > 0.05$.

Discussion

In the first part of this study it was established that 3- to 5-year-old children have little difficulty in discriminating between stimuli differing only in orientation. In the second experiment, the relative salience of orientation as a discriminative cue was assessed under conditions where other stimulus dimensions also varied. The rationale behind this experiment was that the relative salience of different dimensions could be assessed by the extent to which differences on these dimensions influenced subjects' judgments of the similarity between stimuli; it was assumed that the greater the judged similarity between stimuli, the less salient the dimension on which they differed.

Results indicate that for children in the present age range orientation is a less salient discriminative cue than either size or color. Figures the same size and color as the standard, but different in orientation, were judged more similar to the standard than figures at the same orientation as the standard but different in size or color. This finding with respect to the relative salience of orientation is similar to that reported by Lewis and Harwitz (1970) for children of comparable age. Their finding that there was little difference between the salience of size and color was also replicated in the present experiment; a figure half the size of the standard but the same color was here

judged to be no more or less similar to the standard than one the same size but a different color

Subjects younger than 4 years 3 months did not discriminate, in terms of similarity to the standard, between the identical variant and the two variants which differed from the standard in orientation. Results from the first part of the study clearly demonstrate that this finding cannot be due to an inability for these subjects to discriminate visually between different orientations of the same form. Rather, the present finding indicates the low absolute salience of orientation as a discriminative cue for younger subjects. With increasing age, the salience of orientation also increases, at least for males. Older boys judged the identical variant more similar to the standard than the 90 or 180 degree variants. There was no corresponding increase in the salience of orientation for older girls. Such sex differences are difficult to interpret in isolation; there is no reason why boys should spontaneously take account of orientation at an earlier age than girls.

If, as indicated here, different stimulus dimensions have differential salience for young children, one would expect this to be reflected in their performance on other perceptual-cognitive tasks. For example, Odum and Mumbauer (1971) observed that the number of errors young children make in a concept attainment task is inversely related to the salience of the relevant dimension. It remains for further research to evaluate the usefulness of the concept of salience as employed in these studies, to establish the determinants of dimensional salience and to investigate the changes that occur in the salience of different stimulus dimensions in the course of cognitive development.

References

David, H. A. The method of paired comparisons. London: Griffin, 1963.

Davidson, H. P. A study of reversals in young children. Journal of Genetic Psychology, 1934, 45, 452-465.

Ghent, L. Recognition by children of figures presented in various orientations. Canadian Journal of Psychology, 1960, 14, 249-256.

Ghent, L. Form and its orientation: A child's-eye view. American Journal of Psychology, 1961, 74, 177-190.

Ghent, L. Effect of orientation on recognition of geometric forms by retarded children. Child Development, 1964, 35, 1127-1136.

Ghent, L., & Bernstein, L. The influence of orientation on geometric forms and their recognition by children. Perceptual and Motor Skills, 1961, 12, 95-101.

Ghent, L., Bernstein, L., & Goldweber, A. M. Preferences for orientation of form under varying conditions. Perceptual and Motor Skills, 1960, 11, 46.

Gibson, E. J., Gibson, J. J., Pick, A. D., & Osser, H. A developmental study of the discrimination of letter-like forms. Journal of Comparative and Physiological Psychology, 1962, 55, 897-906.

Lewis, M., & Baumel, M. H. A study in the ordering of attention. Perceptual and Motor Skills, 1970, 31, 979-990.

McGurk, H. The role of object orientation in infant perception. Journal of Experimental Child Psychology, 1970, 9, 363-373.

Mussen, P.H., Conger, J. J., & Kagan, J. Child development and personality. New York: Harper & Row, 1963.

Odum, R. D., & Mumbauer, C. C. Dimensional salience and identification of the relevant dimension in problem solving. Developmental Psychology, 1971, 4, 135-140.

Wohlwill, J. F., & Weiner, M. Discrimination of form orientation in young children. Child Development, 1964, 35, 1113-1125.

Footnotes

[1]This research is based upon a doctoral dissertation submitted to the University of Strathclyde, July 1971. The author gratefully acknowledges the advice and encouragement of Dr. H. R. Schaffer who served as supervisor. The research was supported by the Social Science Research Council. The preparation of the report was supported by the National Institute of Child Health and Human Development, under Research Grant 1 P01 HD01762.

Author's address: Educational Testing Service, Princeton, New Jersey 08540.

Table 1

Summed Scores of Individual Subgroups for Variants of Realistic Figure.

(χ^2 values refer to results of D-tests on these scores:

df = 5 for each test.)

Subgroup	n	Variant							
		I	I_{180}	I_{90}	1/2 I	Ir	1/2 I_{180},r	χ^2	p
Younger males	8	31	31	28	16	13	1	61.00	< 0.001
Older males	13	55	42	35	31	30	2	79.05	< 0.001
Younger females	13	51	44	44	27	22	7	71.67	< 0.001
Older females	8	33	26	28	15	17	1	55.33	< 0.001

Table 2

Summed Scores of Individual Subgroups for Variants of Abstract Figure

(χ^2 values refer to results of D-tests on these scores;

df = 5 for each test.)

Subgroup	n	Variant							
		I	I_{180}	I_{90}	1/2 I	Ir	1/2 I_{180},r	χ^2	p
Younger males	8	36	27	29	13	14	1	69.33	< 0.001
Older males	13	56	43	30	30	28	8	66.44	<0.001
Younger females	13	49	48	44	25	25	4	80.49	< 0.001
Older females	8	32	25	25	17	17	4	39.00	< 0.001